BERKELEY LAB

SCIENCE ON THE HILL

The Community Newsletter of Lawrence Berkeley National Laboratory Spring 2002

Health News

New Risk Factor in Heart Disease Identified

Heart disease remains the leading cause of death in the United States. The majority of these deaths result from the hardening of the arteries caused by plaque accumulation, a condition known as atherosclerosis. High concentrations of two blood fats—cholesterol and triglycerides—have been shown to accelerate the rate of plaque accumulation, thus increasing the risk of heart disease.

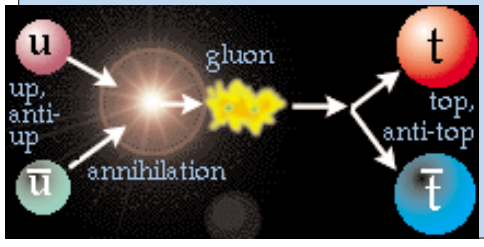
Recently, Berkeley Lab scientists identified the gene for a new apolipoprotein that appears to play a significant role in controlling triglyceride levels in the blood. Scientists Edward Rubin and Len Pennacchio of the Life Sciences Division identified the gene—apoAV—by comparing the DNA sequences of humans and mice. The resulting data indicated that apoAV significantly influences triglyceride levels in both mammals. "By comparing the sequence of the genomes of humans and mice, we have found a genetic jewel that had been missed when the sequence of the human genome alone was analyzed," says Rubin.

As a result of two large clinical studies, the researchers found that 10 percent of the population had the mutation, which resulted in a 20-30 percent increase in triglyceride levels.

The researchers concluded that further study of the apoAV gene could lead to the reduction of triglycerides in the blood, thereby reducing an individual's cardiovascular disease risk factor.

Please go to www.lbl.gov/Publications/Currents/Archive/Oct-05-2001.html#Heart for more information.

ParticleAdventure.org is an award-winning website that allows visitors to explore the world of fundamental particles and forces. Maintained by the Lab's Particle Data Group, users can go on an interactive tour of quarks, neutrinos, antimatter, extra dimensions, dark matter, accelerators and particle detectors.



FRIENDS OF SCIENCE AT BERKELEY LAB

Visitors to the Lab's Open House are among those in the community who share an interest in the science being conducted on the Hill.

Berkeley Lab is pleased to announce the launching of our "Friends of Science" program, an opportunity for those in the community with a curiosity about the natural world to enhance their knowledge of science and technology. Membership is open to all interested parties at no charge, and benefits include regular e-mail communications about science issues and programs, lectures and tours, special mailings of Lab publications, and an interactive website, www.lbl.gov/friendsofscience.

"For community members who want to learn more about how science works, Friends of Science can be a worthwhile educational tool," said Public Affairs Manager Reid Edwards.

Berkeley Lab is committed to improving science education in the schools and increasing public understanding of science through outreach and service. Friends of Science will assist the Lab in meeting these commitments.

To receive a brochure about the Friends of Science program, please contact the Community Relations Office 510-486-7292, or send an e-mail to friendsofscience@lbl.gov. Prospective members can sign up by returning a simple form on the brochure, or by filling out an application online via the above web site. Members will be invited to attend the inaugural April 8 event, a reception and talk from 5:30 to 7:00 p.m. in Perseverance Hall at the Lab. Deputy Director Pier Oddone and physicist Natalie Roe will speak on the challenges of sub-atomic investigations.

Science Education

Students at Garfield Elementary in Oakland learn about electricity and magnetism using the Full Option Science System kit under the watchful eye of FOSS kit developer Linda Delucci from the Lawrence Hall of Science.

Bringing Science into the Classroom

This fall, Berkeley Lab delivered 735 science kits to 82 schools throughout the Oakland School District. The Full Option Science System kits, FOSS kits for short, consist of a series of science lessons developed by the Lawrence Hall of Science to be used as the foundation of the elementary school science curriculum.

The timely delivery of the FOSS kits is a key component of the Oakland School District's commitment to enhance hands-on science education lessons in the schools. Faced with the problem of transportion and distribution, the Oakland School District turned to Berkeley Lab for help. Through the Center for Science Engineering and Education, the Lab provided a driver and a van to the district.

"Berkeley Lab is committed to contributing to our local schools," said Lab Director Charles V. Shank. "Programs like this are the cornerstones for the future of science education."

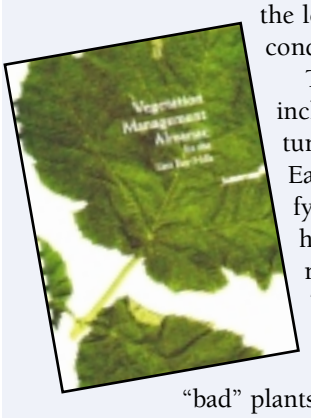
Local Resident, Global Citizen

Vegetation Management

Collaborating to protect hillside communities

A detailed description of how to implement vegetation management as a tool to prevent wildland fires is now available thanks to a collaborative effort among local experts, including Rich McClure of Berkeley Lab's Facilities Department. *The Vegetation Management Almanac for the East Bay Hills* was published recently by the Hills Emergency Forum—a consortium of eight local jurisdictions formed after the 1991 East Bay Hills fire to protect the hills from future conflagrations.

Says McClure, "Wildland fire risks can be cost-effectively managed in ways that work with the local environmental conditions."



The book, which includes 62 full-color pictures, is intended to help East Bay residents identify native plants and habitats to create fire-resistant landscapes. The illustrations serve as a wonderful visual aid for distinguishing "bad" plants while promoting fire-resistant vegetation.

More information can be found at www.lbl.gov/Publications/Currents/ Archive/Sep-07-2001.html#Almanac.

Copies of the Almanac may be purchased from the Tilden Nature Area Environmental Center (510-525-2233) for $25.

The World in Balance

One of the most pressing problems facing the environment today is the increasing amount of carbon in the atmosphere. In response, researchers at the Lab are investigating the path of carbon through land, sea and air. Only the deep ocean stores more carbon than soil does. Cycling ten times more carbon than all the power plants, factories, and vehicles in the world, soil's role in regulating atmosphere and climate makes it essential to life on Earth.

"Because of carbon respiration and storage, soils could be a key determinant of how and when the global climate changes," says Margaret Torn of Berkeley Lab's Earth Sciences Division. "Yet soils are one of the aspects of the terrestrial carbon cycle we know least about."

Torn began to wonder about the impact of humans on nature as a young girl growing up in rural Marin County. As a teenager, political setbacks to environmental initiatives made her determined to apply her math and science skills to studying and protecting ecosystems.

Torn joined Berkeley Lab in 1998 and has become a national expert on how terrestrial ecosystems affect the carbon cycle, and how humans are altering the natural process. Her fieldwork has taken her to many sites, including Hawaiian volcanoes, Alaskan tundra, and the Russian steppes.

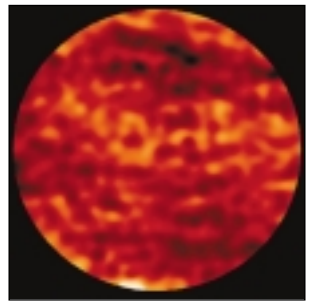
"The central question," says Torn, "is whether soils will buffer the atmosphere against the massive injections of carbon from fossil fuels and other human activity—or do the opposite, by releasing carbon and greatly amplifying human impacts." She is now investigating details of that relationship over a range of soil types and climates.

For more information on Margaret Torn's work, go to www.lbl.gov/wonder/torn.html.

The Next Generation of Computer Chips

In what was hailed as the next major advance in the evolution of integrated circuits, a consortium of industry and government laboratories, including Berkeley Lab, completed the first full-scale prototype machine for making computer chips using extreme ultraviolet (EUV) light. Three beamlines at the Lab's Advanced Light Source provided the essential measurements for the historic printing of the first tiny lithographic circuits in January, a breakthrough that is expected to increase speed and storage capacity tenfold.

Working with Intel, Motorola, Advanced Micro Devices, Micron Technology, Infineon Technologies and IBM, the Lab is developing EUV technology to create processors expected to reach speeds of up to 10 gigahertz (GHz). By comparison, the fastest Pentium 4 processor today is 1.5 GHz. Researchers anticipate that, around 2007, we will see super-small, super-fast computers with capabilities for universal language translation, unprecedented medical and biological analysis, and possibly artificial intelligence.



This "wavefront" represents the aberrations in a nearly perfect lens created to focus EUV light and print ultra-high resolution images for lithography. The little hills and valleys are about 1 nanometer tall.

EUV technology is "the leading horse in the race" for next-generation lithography technology in the industry, according to Intel CEO Craig Barrett. Learn more at www.lbl.gov/Publications/ Currents/Archive/Apr-20-2001.html#_Hlk512396359.

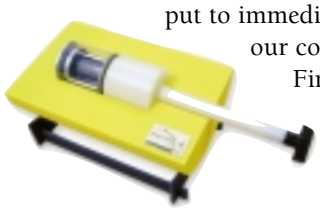
Berkeley Lab Contributes to Antiterrorism Technologies

Lab researchers are offering their expertise to assist with strengthening homeland security. One example of these efforts is the Compact Neutron Source, a portable device that uses neutrons to noninvasively screen the contents of baggage, air cargo and mail. Unique in its speed and intensity, the neutron source would allow the detection of smaller objects, faster screening, and more accurate discrimination among materials. Five to ten systems could be deployed in the field within a year.

Another example of the Lab's antiterrorism work is the Building Occupant Protection Guide. Assembled by environmental researchers, this guide explains how chemical and biological agents spread through office buildings so that preparations can be taken to minimize potential contamination and exposure. Guides will be available for rescue workers and building occupants.

Berkeley Lab Director Charles Shank said of these efforts, "In response to national needs, the Lab's special capabilities can be put to immediate and practical use, while at the same time expanding the frontiers of science. The strength of our country depends upon our technical achievements."

Find more information at www.lbl.gov/Publications/Currents/Archive/Dec-07-2001.html#Terrorist.



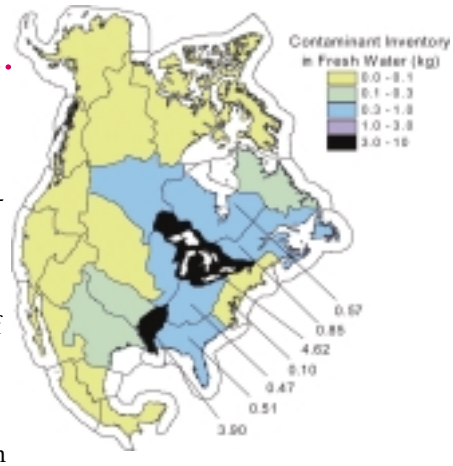
The Compact Neutron Source, currently in development at the Lab's Accelerator and Fusion Research Division, could assist in the speedy screening of mail and baggage.

Tracing Contaminants across North America

To better understand how contaminants travel across the continent, researchers from Berkeley Lab and Canada's Trent University have developed a single model that includes data on toxic releases, wind and water current patterns, and regional differences such as soil and vegetation. Known as the BETR model, it improves on traditional atmospheric models, more completely reflecting how persistent organic pollutants move and accumulate throughout North America by penetrating the soil, water and vegetation.

"This is how contaminants leapfrog across the continent and why air transport models alone don't really work for many persistent organic pollutants," says Tom McKone of the Lab's Environmental Energy Technologies Division. "The model reproduces what we see in the real world."

The next step is to use the model to map human exposure, made more complex by the impact of food-based exposure. For example, an apple bought in Chicago and grown in Washington State could have been contaminated by pesticides from another state. The BETR model will allow researchers to backtrack to the origins of contamination, thereby providing more accurate data to inform regulatory policy. Read more at enews.lbl.gov/Science-Articles/Archive/EETD-BETR-Krotz.html.



BETR model maps the hypothetical spread of the contaminant toxaphene.

Testing the Air at Ground Zero

Berkeley Lab's Advanced Light Source (ALS) aided atmospheric science researchers in making the first in-depth analysis of air collected from "ground zero" at the World Trade Center (WTC).

Courtesy of Time Magazine

Researcher Thomas Cahill of UC Davis announced last month that samples of particulate matter in air collected continuously from early October to mid-December showed unprecedented high concentrations of very fine particles (less than a quarter of a micrometer in size), plus abnormally persistent high levels of coarse particles presumably produced by fires that continued to burn underground. Cahill and his team used an x-ray fluorescence beamline to determine the exact composition of the samples at very high resolution.

"The ALS is, from my point of view, an ideal machine for our work," said Cahill, citing factors such as energy range, tight focus, and stability.

Through some 2,000 separate analyses, Cahill found that the pollution at the WTC was far worse than that from the Kuwait oil field fires during the Gulf War; indeed, New Yorkers downwind from the site were exposed to the most hazardous plumes of extremely fine chemical and metal particles that experts have ever seen. Cahill noted that because the fires are out and the debris pile has cooled, the ground zero site is no longer affecting local air quality.

For more information, go to www.lbl.gov/Publications/Currents/Archive/Feb-22-2002.html.

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Berkeley Lab is managed by the University of California for the U.S. Department of Energy.

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